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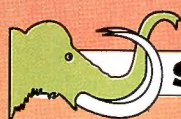
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ARCHAEOPTERYX

The first known bird, *Archaeopteryx*, was discovered in a limestone quarry more than 130 years ago.



Beautifully preserved by the fine-grained limestone, this fossil stunned scientists.

Archaeopteryx combined many of the features of reptiles and modern birds and this caused experts to argue about its origins. Was it the 'missing link' between dinosaurs and today's birds?

THE SAME - BUT DIFFERENT!

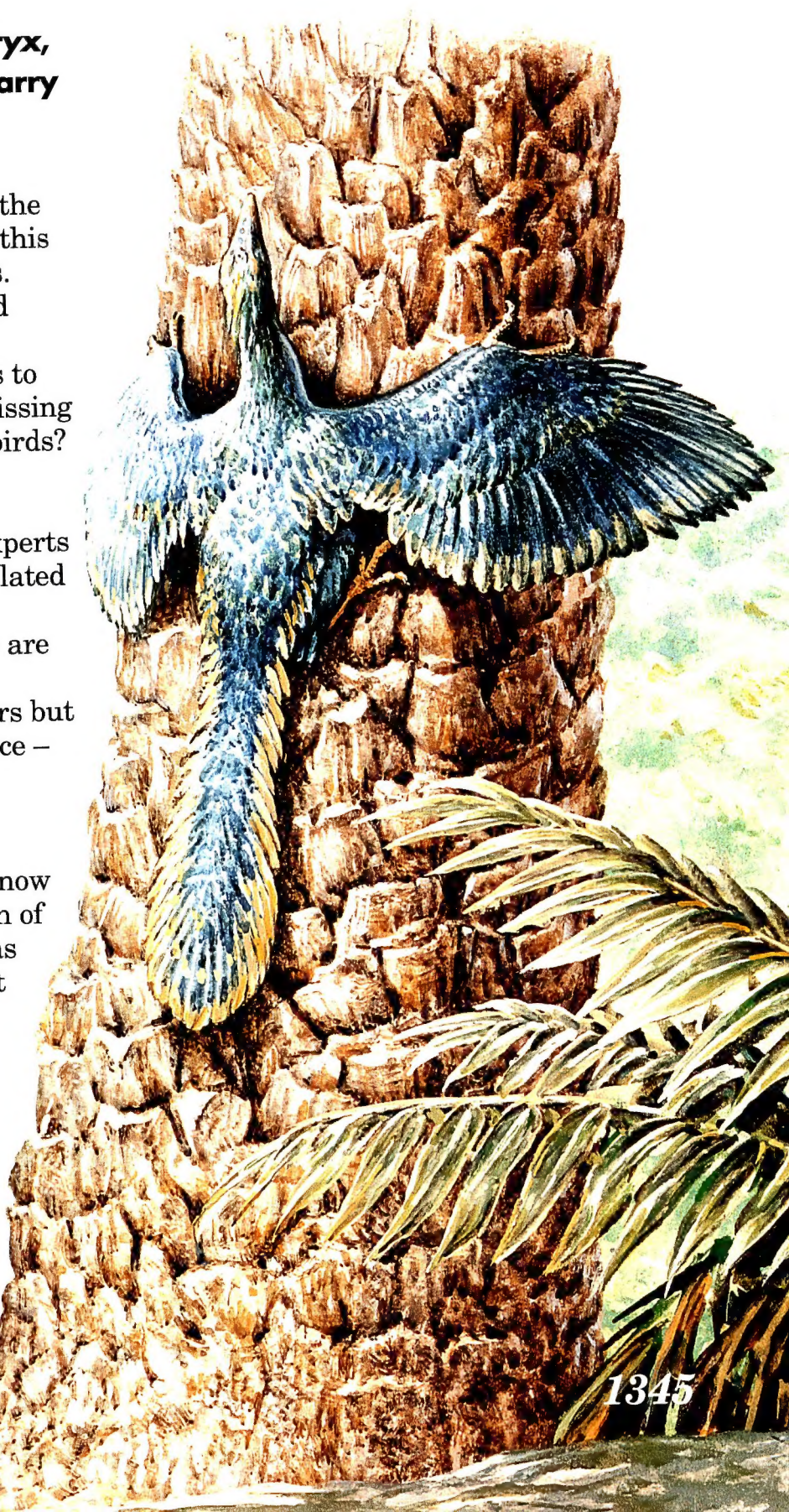
The debate still goes on, but many experts now agree that *Archaeopteryx* was related to small, predatory dinosaurs like *Deinonychus* and *Velociraptor*. There are many striking similarities between *Archaeopteryx* and theropod dinosaurs but there was also an important difference - *Archaeopteryx* had feathers!

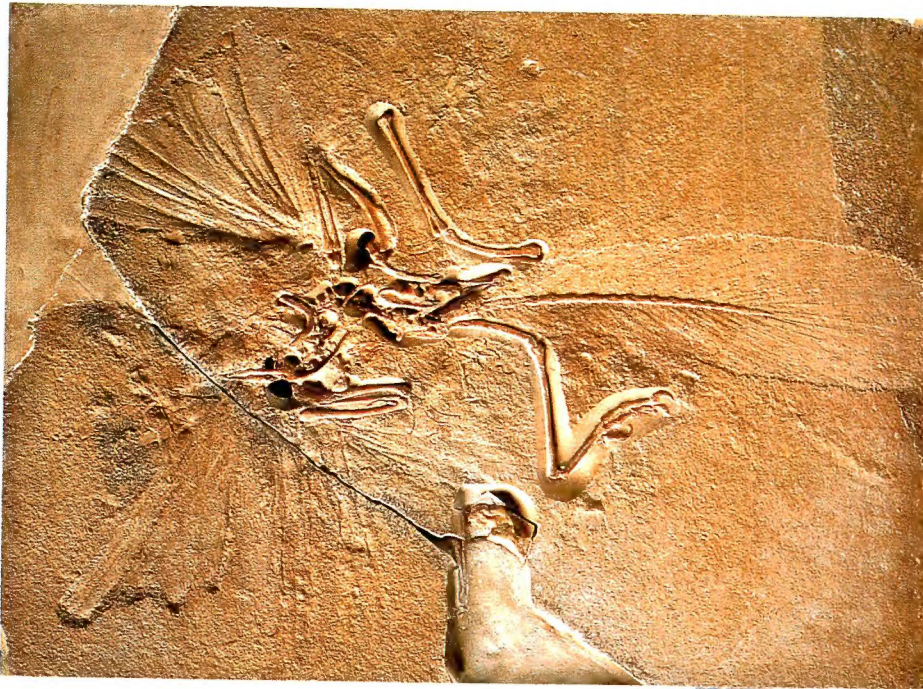
FINDING THE EVIDENCE

Six skeletons of *Archaeopteryx* have now been found, as well as the impression of one of its feathers. The early bird was about as big as a modern magpie but most experts agree it would not be able to fly as well as today's birds.

HUNTING TECHNIQUES

Archaeopteryx probably perched in small trees to watch for passing insects. With a gliding swoop, it would catch its prey as it fluttered to the ground. Or perhaps it sprinted, flapped its wings hard, and took off in pursuit.





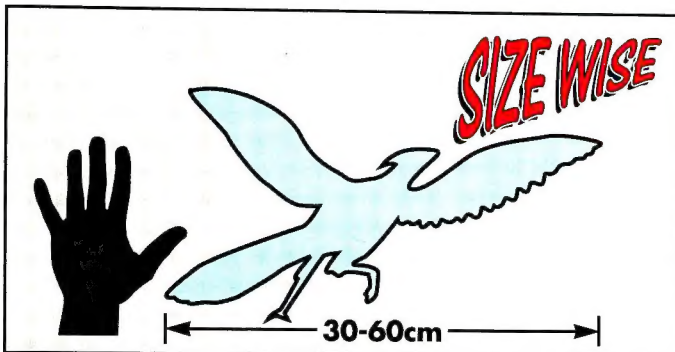
DINOSAUR LOOKALIKE

Archaeopteryx and another small theropod called *Compsognathus*, which has also been found in Germany, had many things in common. The arrangement of their hip bones was very similar and both had clawed fingers, a narrow, flexible neck and a long, bony tail.

Such similarities add weight to the view

that dinosaurs evolved through *Archaeopteryx* into birds. It is not surprising that one skeleton of *Archaeopteryx* was thought to be the remains of *Compsognathus*!

The first fossils of *Archaeopteryx* were found in a limestone quarry in what is now Bavaria in south-west Germany. When *Archaeopteryx* lived there, about 150 million years ago, the climate would have been semi-tropical and the limestone would have been laid down in a warm lagoon near to the land.



SIGHT AND SOUND

Like the birds of today, *Archaeopteryx* had strong legs and feet. Sharp claws and a reversed first toe helped it hold on to branches as it perched above the ground.

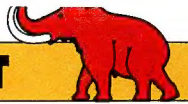
Archaeopteryx kept watch with big, sharp eyes and its large brain helped it react quickly.

WINGS AND CLAWS

Except for the primitive hoatzin of South America, birds of today do not have clawed wings. *Archaeopteryx* had three, separate clawed fingers which jutted out from each wing. Some experts think it used these claws to haul itself up the trunks of trees.

MONSTER FACTS

- **NAME:** *Archaeopteryx* (ar-kee-op-ter-ix) means 'ancient wing'
- **SIZE:** 30–60cm long
- **GROUP:** reptile
- **FOOD:** insects, fish, worms
- **LIVED:** about 150 million years ago in the Late Jurassic Period in Germany



UNIQUE BEAK

No living bird has a beak like that of *Archaeopteryx*. Its jaws were lined with small, sharp teeth. These tiny spikes were probably very useful when *Archaeopteryx* held a victim in its beak. The more its prey wriggled the more damage was done.

IT'S A FACT

FEATHER POWER

It's feathers that make birds different from all other animals and the feathers on *Archaeopteryx* were just like those of a modern flying bird. Feathers are made from a substance called keratin – like hair, horns, claws and your fingernails. Adult birds moult and grow new feathers at least once a year.

Archaeopteryx could probably use its claws to climb up trees. It could also fly a little and run along the ground.





SCUTOSAURUS

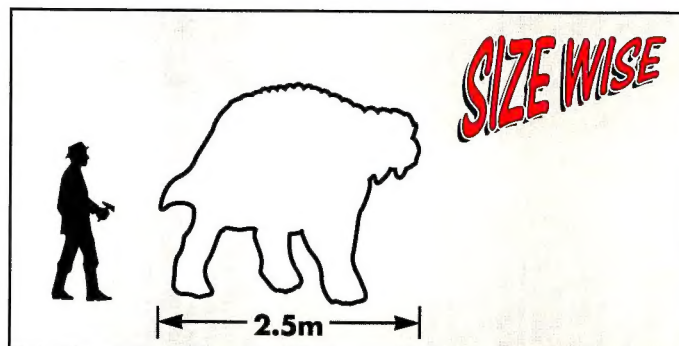
Scutosaurus was a large, lumbering herbivorous reptile with a spiked head and bony armour.



turdy *Scutosaurus* belonged to the pareiasaur family which first appeared in southern Africa during the mid-Permian Period. Several million years later, many pareiasaurs moved into eastern Europe and Asia. *Scutosaurus* and its relatives died out around 245 million years ago.

STRAIGHT LEGS

Scutosaurus walked on four massive, pillar-like legs. Like the bulky dinosaurs which came later, *Scutosaurus* needed its strong legs and broad feet to support its heavy body.

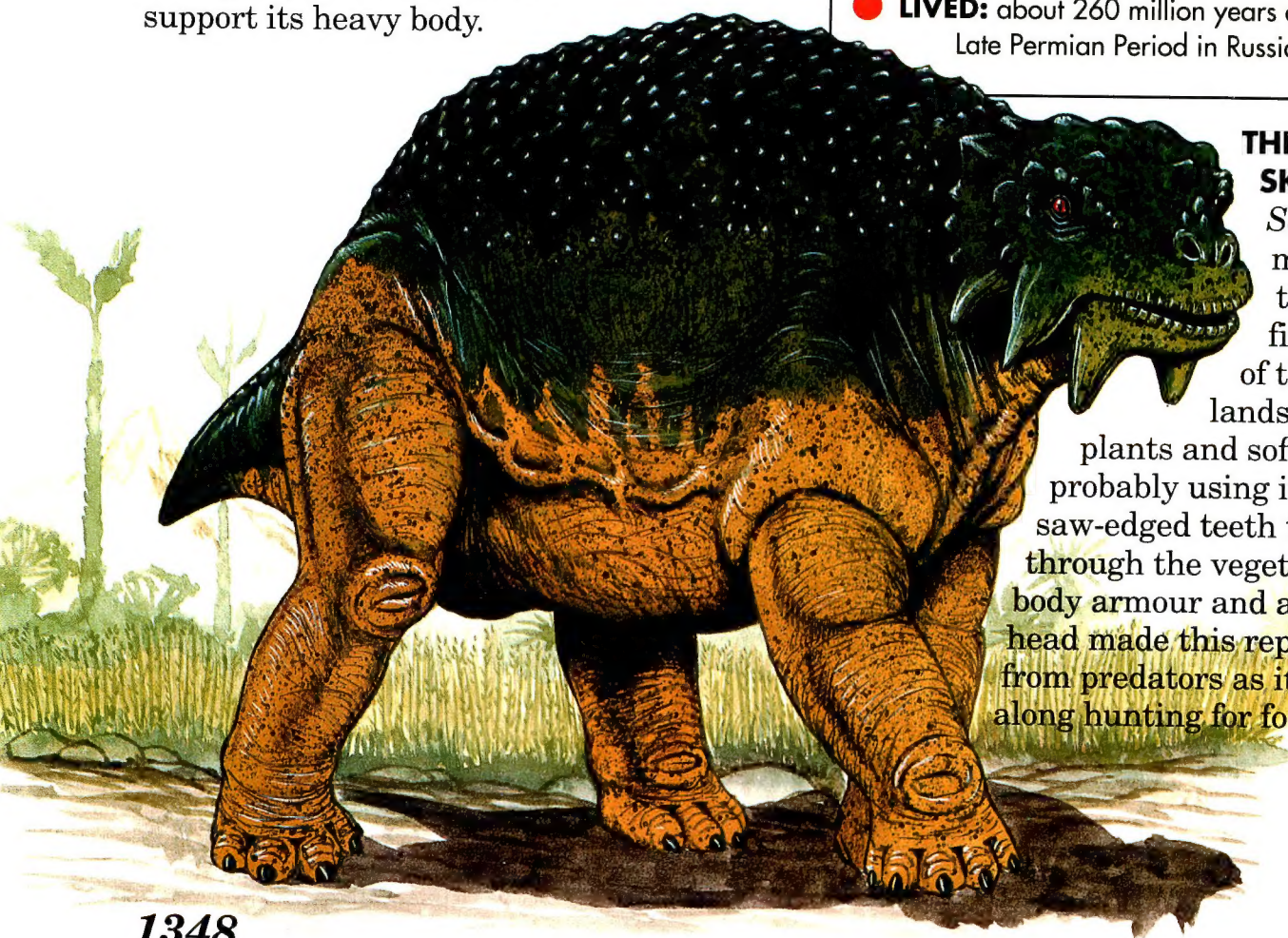


MONSTER FACTS

- **NAME:** *Scutosaurus* (skoo-toh-saw-rus) means 'shield reptile'
- **GROUP:** reptile
- **SIZE:** 2.5m long
- **FOOD:** plants
- **LIVED:** about 260 million years ago in the Late Permian Period in Russia

THICK SKINNED

Scutosaurus moved slowly through the firs and pines of the Permian landscape. It ate plants and soft shoots, probably using its small, saw-edged teeth to slice through the vegetation. Thick body armour and a spiked head made this reptile safe from predators as it lumbered along hunting for food.





PISANOSAURUS

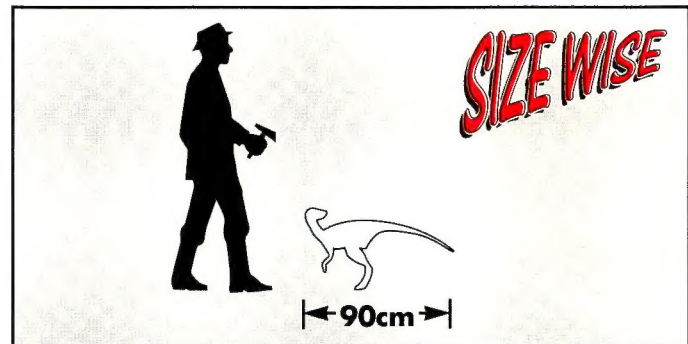
Some experts think that chicken-sized *Pisanosaurus* was the first ornithopod, or bird-hipped, dinosaur.



Unfortunately, not enough is known about this little dinosaur to be certain that it was the earliest of the bird-hipped dinosaurs. Only parts of its backbone, jaw, leg and foot have so far been discovered. Scientists need more evidence before they can be sure of this creature's origins.

AGILE MOVER

Pisanosaurus was less than 1m long and its slender tail made up almost half its length. It was an extremely agile dinosaur and moved swiftly and easily across the fern-covered ground of Triassic Argentina.



MONSTER FACTS

- **NAME:** *Pisanosaurus* (pi-zan-o-saw-rus) means 'Pisano's reptile'
- **SIZE:** 90cm long
- **GROUP:** dinosaur
- **FOOD:** plants
- **LIVED:** about 210 million years ago in the Late Triassic Period in Argentina, South America

FREE HANDS

As it walked on its two long back legs, this little dinosaur kept its hands free to tug at low-growing plants and leaves. Like *Lesothosaurus*, it had small, pointed teeth which it probably used to chew up the woody parts of plants.



Plant power

Without plants there would be no animals. Throughout prehistory, plants have led the evolution of animals.



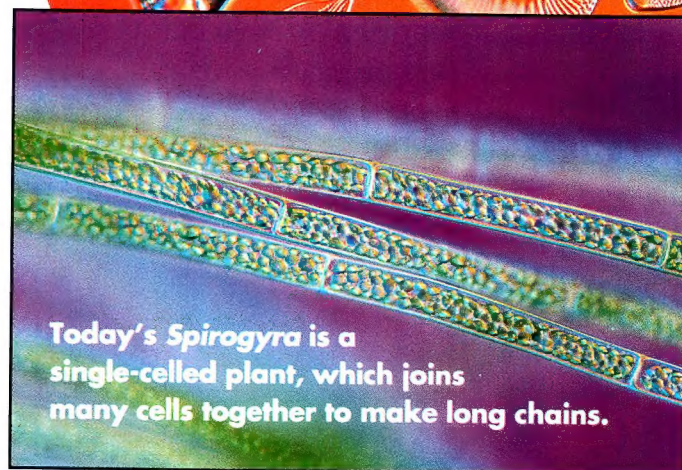
Plants are food for plant-eating animals which, in turn, are food for meat-eating animals. So plants have supported the great food webs since before the Age of Dinosaurs.

THE FIRST PLANTS

The first plant-like life-forms were microscopic single cells floating in the sea. They belonged to a group called the algae, and appeared over 1,000 million years ago. Some plants, such as *Spirogyra*, joined their cells into chains or necklaces.

ANCIENT ALGAE

As algae evolved, they became many-celled and more complicated. Some resembled today's plants, such as the sea lettuce *Ulva*, the brown wrack seaweed, *Fucus*, and *Ceramium*, a red alga. The early jellyfishes, worms and trilobites lived among these ancient algae.



Today's *Spirogyra* is a single-celled plant, which joins many cells together to make long chains.

Algae such as these probably lived over 500 million years ago and looked very like today's *Ulva* (left), *Fucus* (centre) and *Ceramium* (right).

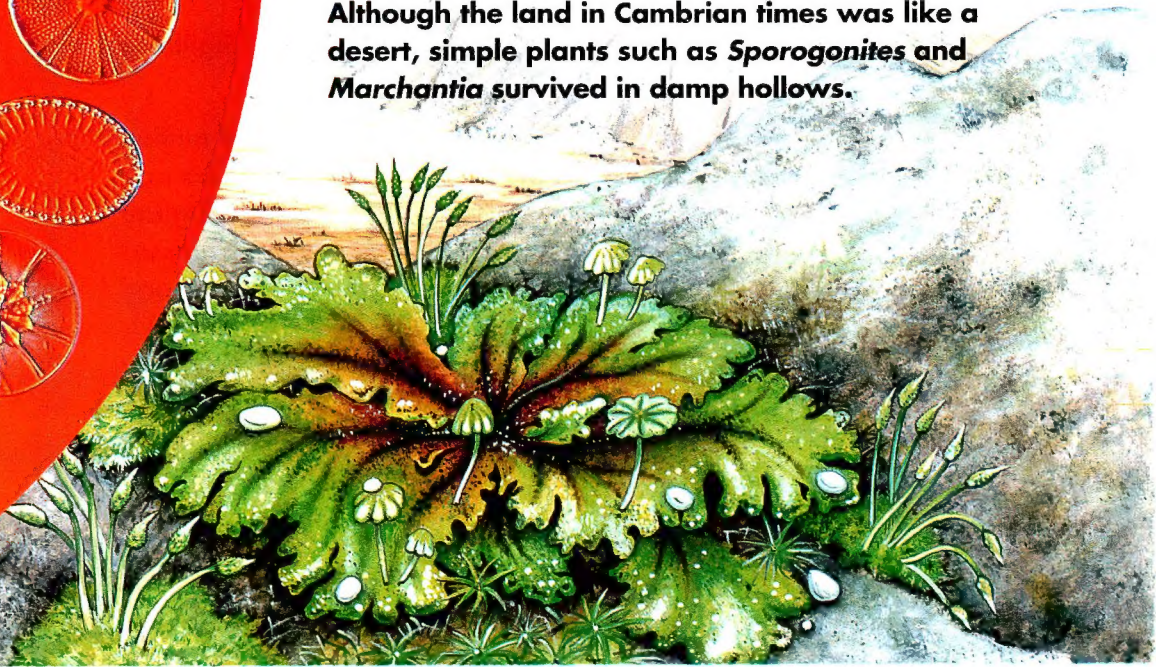
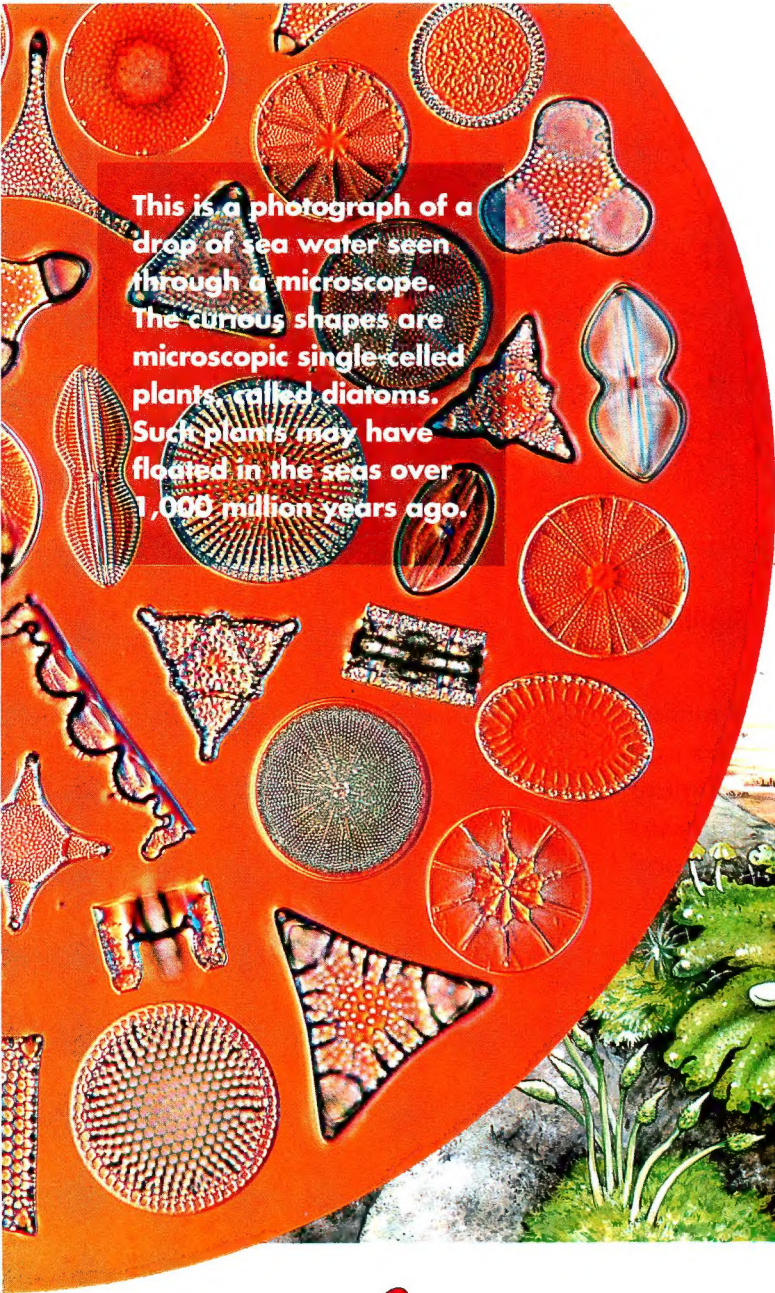


This is a photograph of a drop of sea water seen through a microscope. The curious shapes are microscopic single-celled plants, called diatoms. Such plants may have floated in the seas over 1,000 million years ago.

AT THE WATER'S EDGE

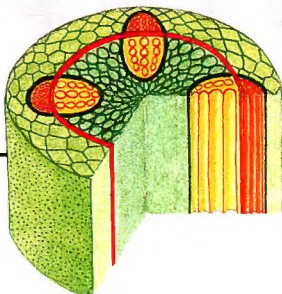
In Cambrian times, 500 million years ago, the land was like a desert. There were no land plants, and so there were no land animals. But, around the edges of rivers and lakes, life stirred. Some plants managed to survive in damp hollows, splashed by the waves. These were the early mosses and liverworts.

Although the land in Cambrian times was like a desert, simple plants such as *Sporogonites* and *Marchantia* survived in damp hollows.



What is? A VASCULAR PLANT?

It's a plant with a network of tubes that carries water and sap to all parts of the plant, from the deep roots to the shoot tips. These tubes are shown in the diagram in yellow and brown. The vascular system was vital for plants to conquer the land. Algae (including seaweeds), mosses and liverworts are not vascular plants. Almost all other plants are, from clubmosses to trees. You have a vascular system, too – your blood vessels and blood.



INVASION OF THE LAND

The great step for land plants was the development of a vascular system. This is a network of tubes that carries water and sap around the plant's body, so that it does not need to live under water or in a very damp place. Fossils show that the first vascular plants edged their way on to land 410 million years ago. *Cooksonia* was probably the first. It was only as tall as your finger, and thinner than a drinking straw. But its stiff tubes sucked water from the ground, and held the plant upright in the air.

Cooksonia





EXPLODING PLANTS

Once small plants like *Cooksonia* had got a root-hold on the empty land, there was an explosion in plant evolution. Many new groups evolved, some to giant sizes.

ROOT-HOLD

About 370 million years ago lived *Asteroxylon*, a clubmoss, about 1m tall.

By Carboniferous times, 300 million years

ago, clubmosses such as *Lepidodendron* and *Sigillaria* were like giant trees, 30m high, as were horsetails, such as *Calamites*. Like all plants, whether green or red, they lived by trapping the energy from the sun, using a chemical process called photosynthesis. Both the clubmosses and horsetails survive today, but they rarely grow more than 1m tall.

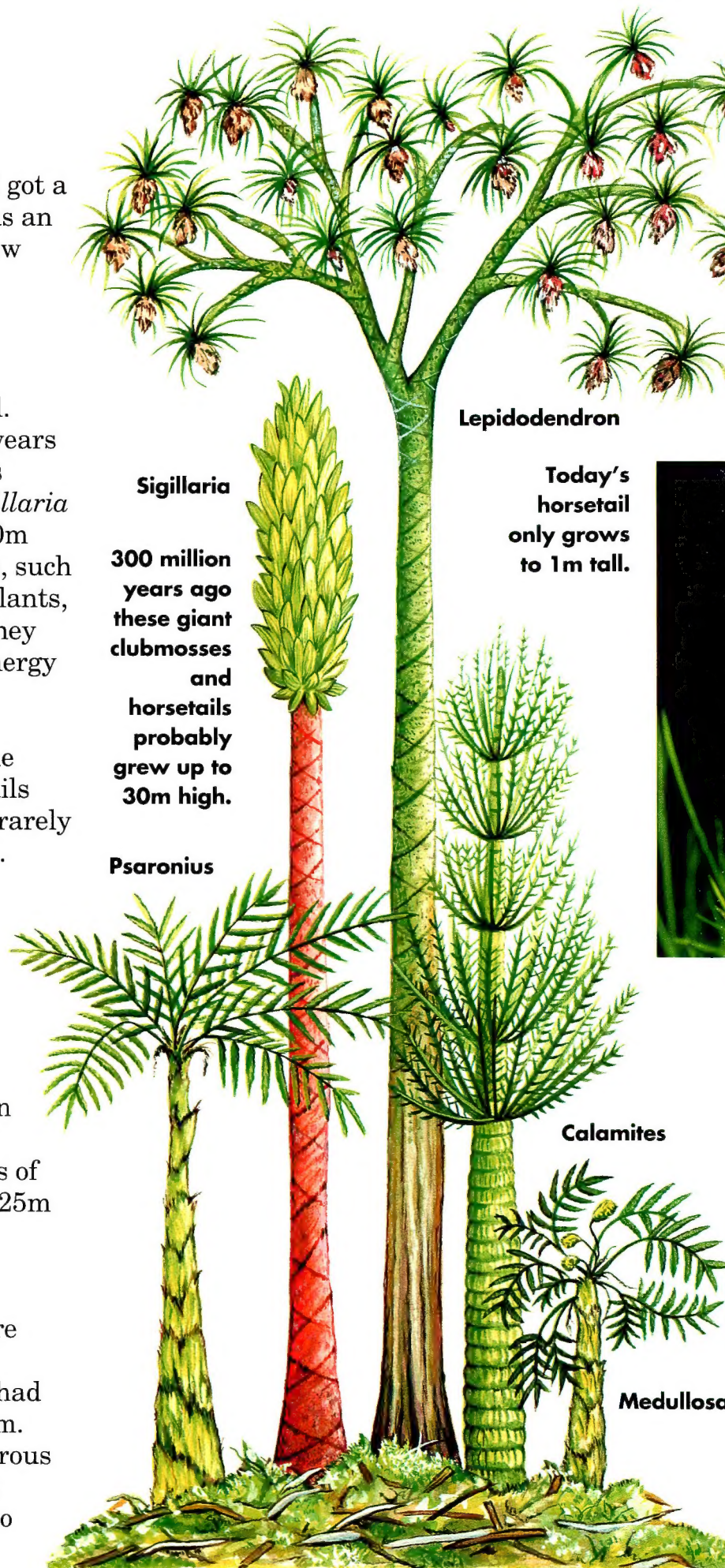


FORESTS OF FERNS

Since the Carboniferous Period, many types of ferns have evolved, with their feathery-looking fronds. Some are still with us today. Tree-ferns, or marattites, were large ferns with woody stems, resembling modern palm trees. *Psaronius* was up to 10m tall, and shaded the giant amphibians of the Permian Period. Tree-ferns up to 25m tall still grow in some tropical areas.

THE FIRST SEEDS

The seed-ferns, or pteridosperms, were the first plants with true seeds (not spores as in mosses and ferns). They had feathery fronds on a short, woody stem. They flourished during the Carboniferous Period, but then gradually died away. Some, like *Medullosa*, grew to be up to 5m high.



Lepidodendron

Today's
horsetail
only grows
to 1m tall.

Sigillaria

300 million
years ago
these giant
clubmosses
and
horsetails
probably
grew up to
30m high.

Psaronius

Calamites

Medullosa



NAKED SEEDS

Fern-like plants called bennettites, such as *Williamsonia*, appeared at about the same time as the dinosaurs. Bennettites belonged to a successful new group – the gymnosperms, or ‘naked-seed’ plants.

STILL ALIVE

Cycads were also gymnosperms. They had dumpy, woody stems topped by whorls of palm-shaped fronds. Cycads were very successful during the Age of Dinosaurs.

DINO DINNERS

More gymnosperms evolved that still survive today. They include yew trees and ginkgoes. The best-known gymnosperms are the conifers –

fir trees, pines and larches. The first ones appeared in late Carboniferous and early Permian Periods. They had fronds arranged like upside-down umbrellas and many dinosaurs must have chomped their leaves.

FLOWERS AT LAST

The last main group, the flowering plants, or angiosperms, probably appeared over 120 million years ago. By 100 million years ago they were taking over the landscape. More than four-fifths of all plants today are flowering plants, from beautiful roses and irritating weeds to towering oak trees. Millions of years ago, the bright petals of magnolias and water lilies brought vivid new colours to the world.

NEW BURST

Plants had one more big burst of evolution. About 20 million years ago, grasses appeared. The arrival of grasslands led to a whole new batch of fleet-footed, grazing mammals.



Tree-ferns like *Williamsonia* (left) and cycads (right) provided food for plant-eating dinosaurs.

What is?

PHOTOSYNTHESIS

It means ‘building with light’. Special chemicals in the plant take in energy from the sun’s light rays. They use this to join together simple nutrients, which the plant absorbs from the water or soil. The nutrients are built up into the plant’s new roots, stems and leaves. The main photosynthetic pigment is chlorophyll, which is green – and that’s why most plants are green. Red algae have carotenoids which makes them red. This is what makes carrots red too!

GIANTS OF THE PAST



ARCHAEOPTERYX

A detailed illustration of an Archaeopteryx in flight. The creature has large, vibrant blue feathers with yellow borders on its wings and tail. Its body is covered in similar blue and yellow plumage. It has a long, curved neck and a small head. Its legs are extended, showing orange-brown skin and sharp, black claws. The background is a lush, green forest with various plants and trees, creating a sense of a prehistoric environment.

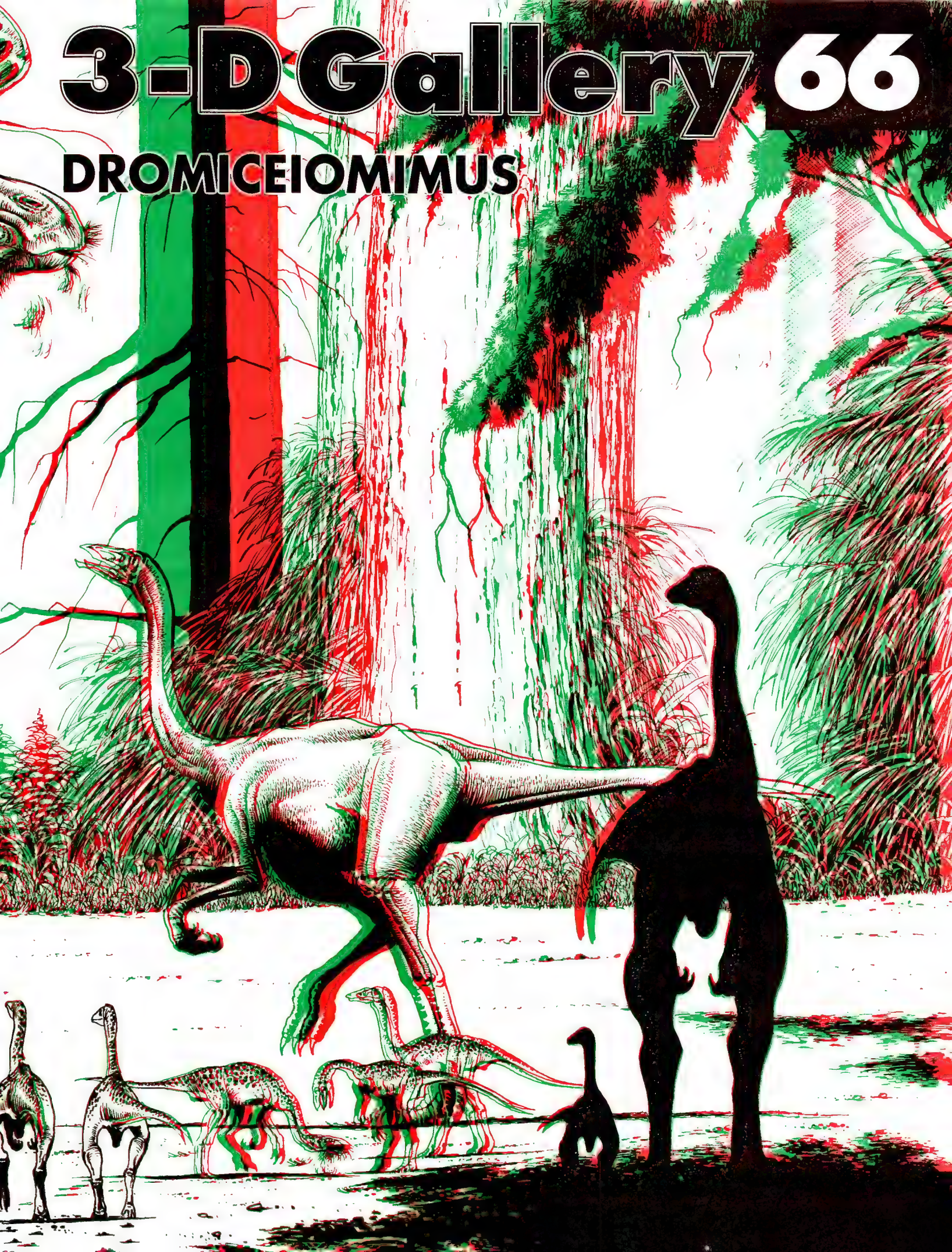
It is the Late Jurassic Period and central Europe is a land of hot, steamy forests. Here, *Archaeopteryx* glides through the trees searching for food. With its fierce beak lined with sharp, spiky teeth, the clawed fingers on its wings, and its large eyes, *Archaeopteryx* can easily catch and kill this dragonfly.



In Late Cretaceous Canada *Lambeosaurus* quietly eats a meal of plants and leaves. A pack of *Dromiceiomimus* crowds around, waiting for spare food to fall. The speedy *Dromiceiomimus*, each adult the size of an average car, are dwarfed by *Lambeosaurus*, which stands over 15m long.

3-D Gallery 66

DROMICEIOMIMUS





Lift off!

It is very difficult for an animal that is heavier than air to fly. Flying took millions of years to perfect, and before they could fly, animals had to evolve wings and very light bodies.



All flying creatures have wings of some sort to help them fly. Wings are a special shape. A wing that is flat underneath and curved on top is called an aerofoil. When an animal is airborne, the air flows over the top of the aerofoil faster than it flows beneath it. This difference in the speed of the air lifts the flying animal up and keeps it airborne. The wings of aeroplanes are aerofoils – but nature thought of it first!

FLAPPING FLYERS

Animals such as pterosaurs, birds and bats learned how to flap their wings to fly (birds and bats are still flapping, of course). Pushing down on the air by flapping the wings also lifts an animal and keeps it up in the air. Flapping flight helps animals to travel long distances in search of food. Some birds today have such strong muscles that they can fly for thousands of kilometres.

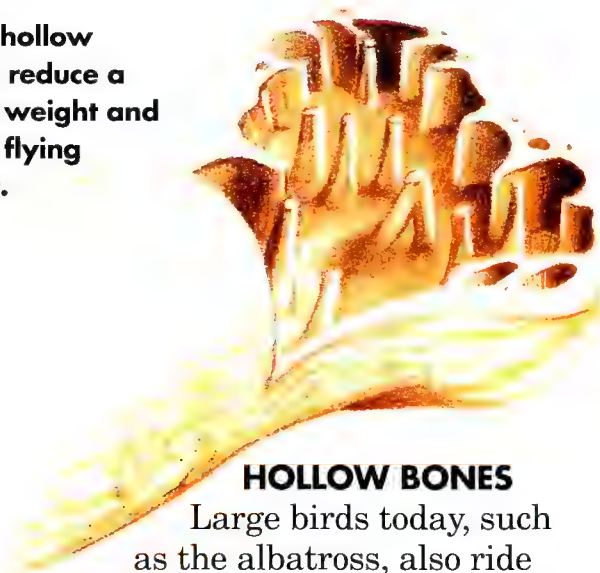
THE GLIDERS AND SOARERS

Some animals do not flap their wings, they glide. Flying mammals and reptiles use flaps of skin which they stretch out so they can glide. These also act as aerofoils when flying. Many flapping flyers glide to give their wings a rest. Pterosaurs and large birds like *Argentavis* probably rode on the air currents like huge kites. When the air hit the edge of the vast aerofoil wing it lifted the animal up.

Argentavis was the largest bird ever to fly. It lived about six million years ago and soared through the air searching for dead or dying animals on which to feed.

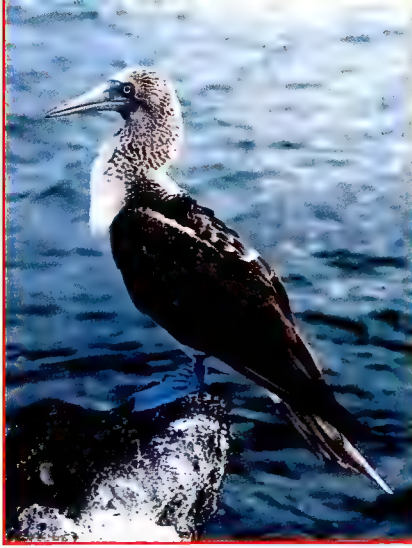
Strong chest muscles for flapping wings

Light, hollow bones reduce a bird's weight and make flying easier.



HOLLOW BONES

Large birds today, such as the albatross, also ride the air currents and can stay in the air for hours without flapping their wings. All flying animals need to be as light as possible. Bones are very heavy so, in order to fly, animals such as pterosaurs and birds needed to have bones that weighed very little. So they evolved hollow bones which were very light.



Today's Blue-footed Booby does not flap its wings to slow down, and often falls over on landing.

Lightweight skeleton is designed for flight

Long pointed wings over 7m in length for soaring and gliding

Wings were aerofoils that helped to lift *Argentavis* into the air



Long tail feathers for steering



Just before landing, today's macaw spreads its wings to slow down its speed.

This Jumbo jet weighs many tonnes but can fly using aerofoils, just like a bird.



LIGHTEN UP

Light bones, together with wings or skin flaps, enabled these animals to get into the air and stay there more easily than an animal with heavy, solid bones. Even the gigantic prehistoric bird *Argentavis* was light enough to fly.

STEERING IN AIR

Once an animal is flying, it may need to change direction. Many birds have long, tail feathers which, like a rudder, help them turn right or left. Some birds steer with their feet too, while other flying animals use their wings to change direction.

Air flows faster over the top of an aerofoil which makes a vacuum over the top of the wing.



The air under the wing is at a higher pressure so it pushes the wing up. This keeps the owner of the wing - bird, bat, pterosaur or aeroplane - in the air.

Learning to fly

An animal that can fly can escape from enemies more easily and catch food that land animals cannot reach.

1

GLIDING INTO FLIGHT

Animals that glide do not flap their wings. They leap from a branch, open their wings or skin flaps, and let the air carry them along until they land again. Gliding may have evolved because animals that lived in trees needed to leap from tree to tree to escape a predator or to reach food.

The earliest flying animals, apart from insects, were the

pterosaurs. These flying reptiles first appeared about 190 million years ago.

That's 70 million years before the first bird. Experts have different theories of how these reptiles first came to fly. Did they glide or jump? Either or both theories may be correct. Sometimes evolution tries out two ways of doing the same thing.

2

SKINNY WINGS

Pterosaurs had wings of skin, not feathers. These may have developed from flaps of skin which helped their ancestors to glide from tree to tree.

This reptile may have glided from branch to branch to catch its prey.

ANCIENT AND MODERN GLIDERS

Several living animals, such as the flying lemur, have skin flaps so they can glide from tree to tree. We also know that several ancient reptiles, such as *Coelurosauravus* (a 'flying' lizard), glided in a similar way.



**Is it
true****that scientists do not
really know how flight
began?**

Yes. Scientists are not yet certain which of these theories explains how pterosaurs, birds or bats evolved wings. Of course the evolution of wings and flight took millions of years. Perhaps one day a palaeontologist will discover a fossil that answers this question.

3

These three stages
show how reptiles
may have jumped,
then used their skin
flaps to fly.

JUMPING INTO FLIGHT

Some experts prefer the jumping theory. They say that flapping flight evolved first because animals jumped into the air to catch prey. A small running reptile that hunted insects found that if it jumped into the air it could catch many more flying insects.

FLAPS FOR FLYING

Such a creature may have developed flaps of skin on its arms to scoop up insects. Over a great deal of time, these flaps of skin might have become strong enough to hold the reptile in the air for a few seconds while it caught insects. Eventually they evolved into wings. Of course it was much harder to jump into flight from the ground than it was to fall

1 out of a tree
and glide.

2

INSECTS IN THE AIR

Insects were probably the first animals to fly. Most were much smaller and lighter than birds, bats and pterosaurs, and they did not have backbones. Many different sorts of insects can fly, including dragonflies. Dragonflies skimmed through the air before dinosaurs walked the Earth and they are still expert flyers today.

Dragonflies are insects,
and insects were the first
animals to fly. They
skimmed the air
before the Age of
Dinosaurs.



This ancient bird, *Osteodontornis*, was among the largest-ever flying birds. It may have seized sea creatures, such as squid, in its bony, spiked beak.

FEATHERED FRIENDS

After the insects, birds were the second group of animals to take to the air. The earliest known bird, *Archaeopteryx*, lived about 150 million years ago. *Osteodontornis*, which lived about five million years ago, had a wingspan of over 5m and was similar to today's albatross. Perhaps this great sea bird mastered the air currents and rode the strong breezes around the coastline.

THE MODERN FLYERS

There are many more birds alive today than any other type of flying vertebrate. The art of flying has come a long way from the early flapping birds that tried to fly, to today's supreme masters of the air.

MASTERS OF THE AIR

The swift eats, sleeps and mates in the air. It only lands when it builds a nest, lays its eggs and feeds its young. One type of swift spends nine months in the air. When it is only a few weeks old, the Arctic tern makes an incredible flight from the Arctic to the Antarctic, a distance of 18,000 km. It flies all the way back to the Arctic again before it is a year old.

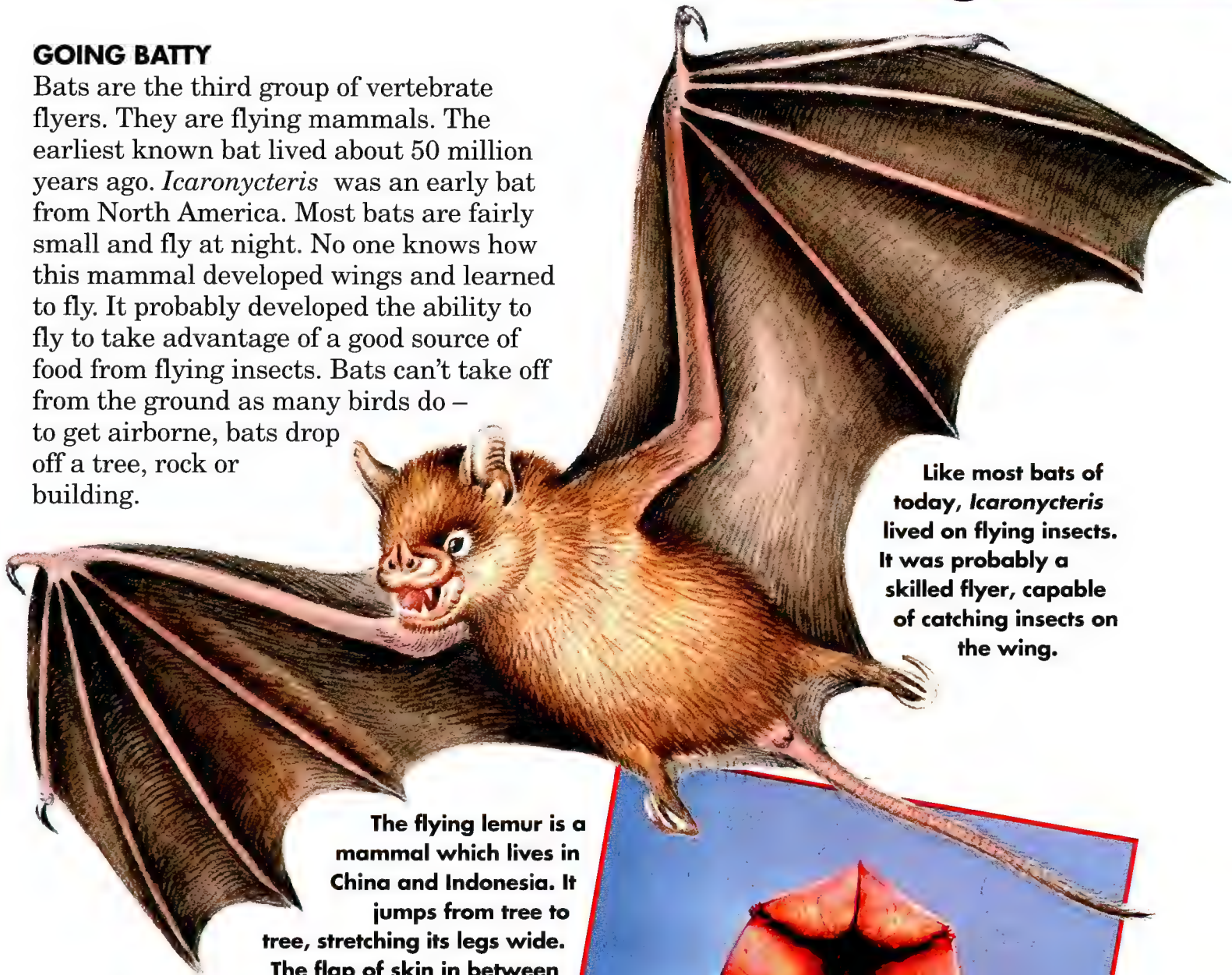


Today, the albatross is a master of gliding flight. It can soar over the oceans for hours without beating its wings. *Osteodontornis*, which lived five million years ago, may have patrolled the oceans in much the same way.



GOING BATTY

Bats are the third group of vertebrate flyers. They are flying mammals. The earliest known bat lived about 50 million years ago. *Icaronycteris* was an early bat from North America. Most bats are fairly small and fly at night. No one knows how this mammal developed wings and learned to fly. It probably developed the ability to fly to take advantage of a good source of food from flying insects. Bats can't take off from the ground as many birds do – to get airborne, bats drop off a tree, rock or building.



Like most bats of today, *Icaronycteris* lived on flying insects. It was probably a skilled flyer, capable of catching insects on the wing.

The flying lemur is a mammal which lives in China and Indonesia. It jumps from tree to tree, stretching its legs wide. The flap of skin in between allows it to glide for up to 80m.



IT'S A FACT

AIR SPEED RECORD

One of the fastest animals in the world is a bird. The peregrine falcon can reach speeds of 131km/h when it is diving through the air for prey. It usually preys on other birds.

ODDBALLS

Today there are gliding animals which are not birds or bats. These are the 'flying' lizards, frogs, snakes, fishes, foxes, lemurs and squirrels. None of them has wings. Lizards, foxes, lemurs and squirrels have flaps of skin. Fishes use huge fins to glide over the tops of waves. Frogs use their feet, and the flying snakes their whole bodies.



A DAY IN THE LIFE OF PARASAUROLOPHUS

ONE DAY IN THE CRETACEOUS PERIOD, JUST AFTER THE SUN HAS RISEN OVER ALBERTA, A HERD OF PARASAUROLOPHUS IS GRAZING BY THE BANKS OF A RIVER...

... AND ONE YOUNGSTER HAS SPOTTED SOMETHING IT HAS NEVER SEEN BEFORE - AN ARMoured PALAEOSCINCUS,

THE MOTHER DOES WHAT SHE CAN TO HELP HER BABY TO SAFETY.

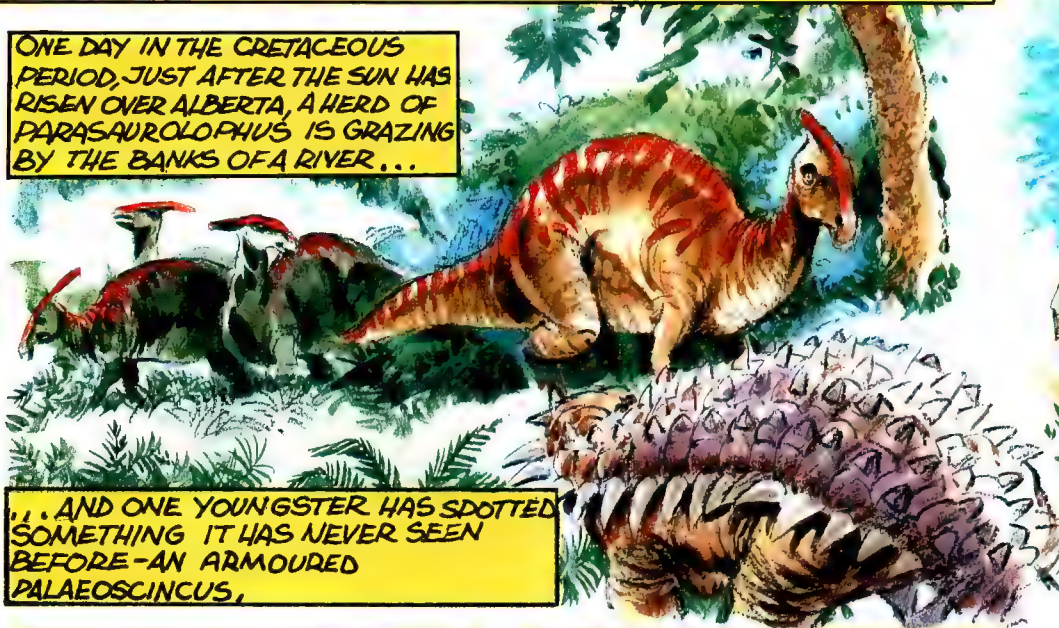
THE HORROR STRUCK ADULT GETS TO THE DEEP WATER JUST IN TIME...

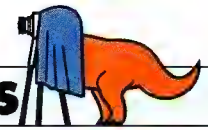
ALONE WITH ITS PREY, THE TYRANNOSAURID IS AT LEISURE TO GORGE ITSELF UNTIL IT IS FULL.

BUT IT'S TOO LATE, THE YOUNG PARASAUROLOPHUS CANNOT RUN QUICKLY ENOUGH TO ESCAPE A DREADFUL DEATH.

... A MOMENT LATER AND SHE WOULD HAVE MET A SIMILAR FATE TO HER YOUNGSTER.

LITTLE PARASAUROLOPHUS GETS TOO CLOSE AND CUTS ITS LEG.





THE MOTHER SEES HER BABY IN TROUBLE AND PUSHES IT BACK TOWARDS THE REST OF THE HERD WHO HAVE CARRIED ON MUNCHING, UNAWARE OF THE INCIDENT.

... FOR A PREDATORY TYRANNOSAURID, WHOSE EXPERIENCE TELLS HIM THAT LARGE HERDS SOMETIMES OFFER EASY PREY, HAS SPOTTED THE INJURED BABY PARASAUROLOPHUS.

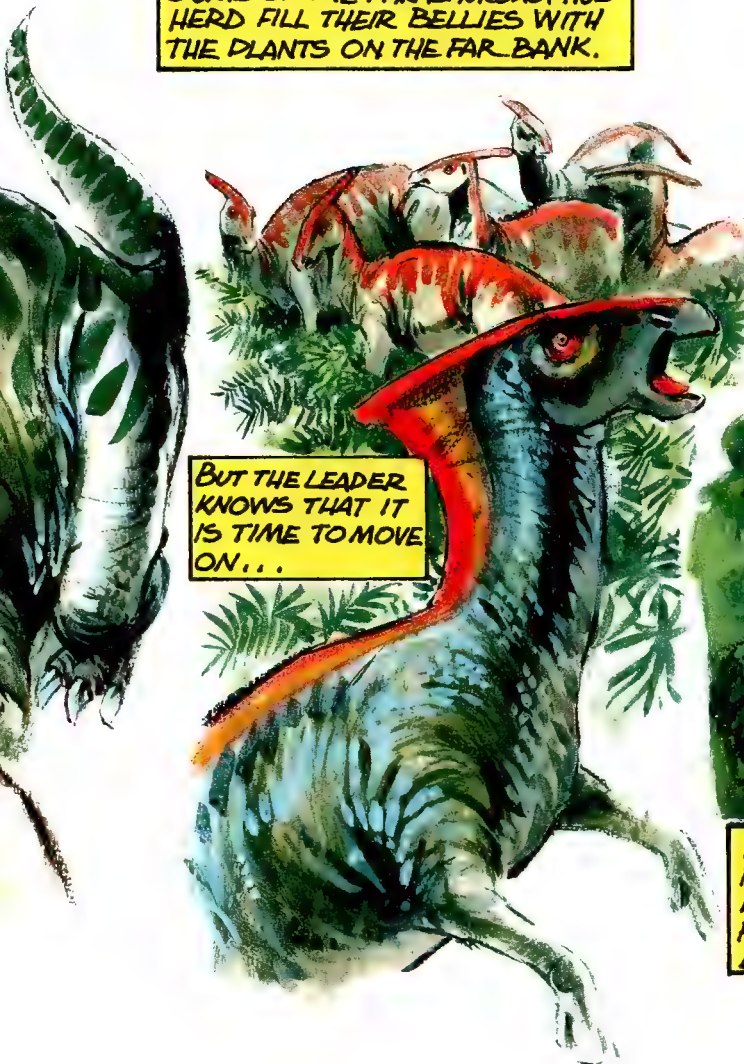


BUT THE CALM IS ABOUT TO BE SHATTERED...

AFTER THEIR EXHAUSTING SWIM, SOME OF THE PARASAUROLOPHUS HERD FILL THEIR BELLIES WITH THE PLANTS ON THE FAR BANK.

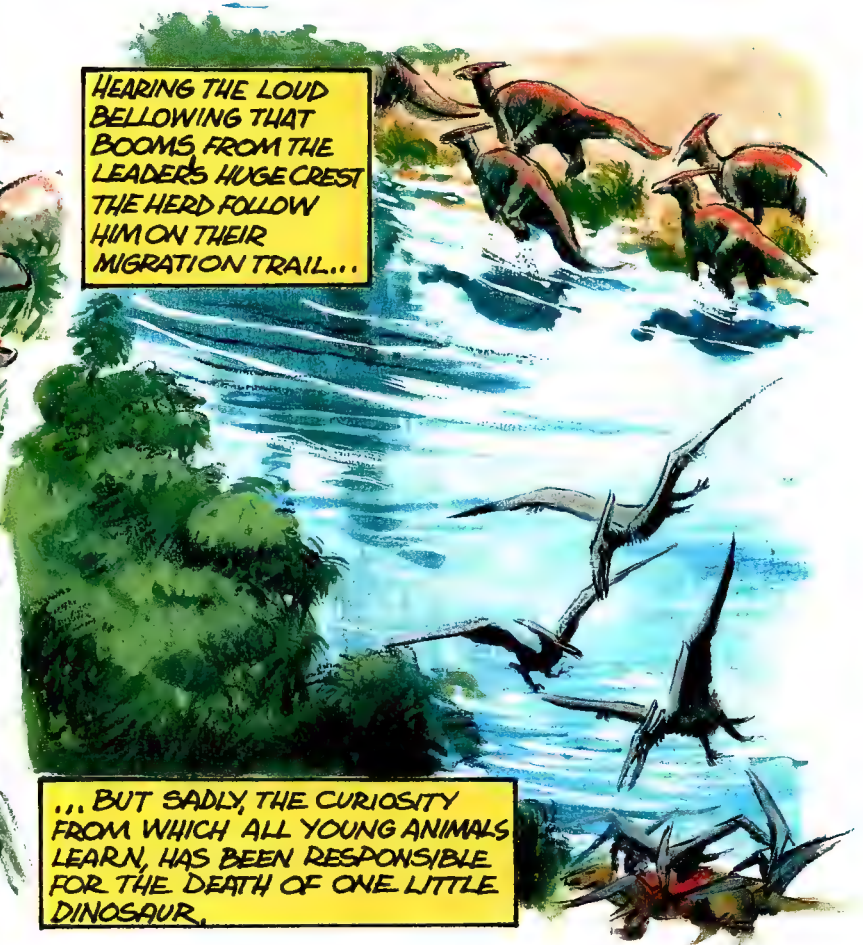


THE TERRIFIED PARASAUROLOPHUS RUN FOR THE SAFETY OF THE WATER.



BUT THE LEADER KNOWS THAT IT IS TIME TO MOVE ON...

HEARING THE LOUD BELLOWING THAT BOOMS FROM THE LEADER'S HUGE CREST THE HERD FOLLOW HIM ON THEIR MIGRATION TRAIL...



... BUT SADLY, THE CURIOSITY FROM WHICH ALL YOUNG ANIMALS LEARN, HAS BEEN RESPONSIBLE FOR THE DEATH OF ONE LITTLE DINOSAUR.

Improve and test your
knowledge
with...

FACT FILE

Fascinating facts
to read and
10 fun questions
to answer!

Can you read the bottom
line?

Plesiosaurs had very flat eyes.
They would only have been able to
focus properly underwater. A
plesiosaur would have been almost
blind on the surface.

1

A *Branchiosaurus*
was the size of:

- a) an adult human's palm
- b) an adult human's foot
- c) an adult human's arm

2

Carl Linnaeus invented a
system for:

- a) catching *T rex*
- b) naming animals and plants
- c) writing scientific papers

3

Carrots and red algae
are red because:

- a) they are sunburnt
- b) they contain carotenoids
- c) they are ready to eat

4

Archaeopteryx
was a:

- a) fish
- b) reptile
- c) dinosaur

5

Animals learned to
fly to:

- a) get a better view
- b) catch food
- c) show off

6

The first plants on Earth
lived:

- a) in water
- b) under the ground
- c) on dinosaurs

7

Armoured *Scutosaurus*
survived by eating:

- a) plants
- b) meat
- c) berries

8

Which animals
were the first to fly?

- a) insects
- b) pterosaurs
- c) birds

9

Carcharodon was an
enormous:

- a) carrot
- b) shark
- c) tree

A star of ill omen

Every 26 million years or so, there seems to be a mass extinction of animals – big or small. Some scientists think that a currently unknown star comes close to the solar system at this time. They think it disturbs the orbits of the comets, throwing them all over the place. Some of these comets inevitably hit the Earth, causing the extinctions.

Wrong horns

In 1887 the first Triceratops remains to be found were a pair of horn tips. The American palaeontologist Othniel C. Marsh, who discovered them, thought that they were the horns of some kind of bison!

10

To make them lighter birds had:

- a) empty tummies
- b) small suitcases
- c) hollow bones

Absolutely abominable!

The giant ape Gigantopithecus from the Pleistocene Epoch in China must have stood nearly three metres tall. Some people think that it still survives in the Himalayas and that it is the source of the legend of the abominable snowman.



Abominable snowman



Gigantopithecus

Double teeth

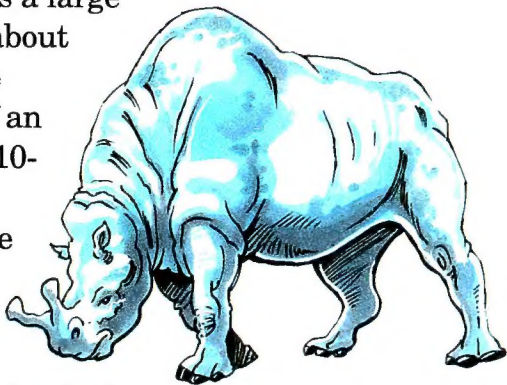
Baryonyx had twice as many teeth in its lower jaw than in its upper jaw. Nearly all other dinosaurs had the same number top and bottom.

BRANCHIOSAURUS**300 MYA**

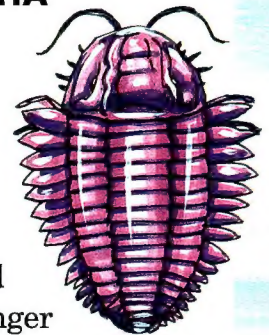
No bigger than the palm of an adult human's hand, *Branchiosaurus* (bran-kee-oh-saw-rus) was a tiny amphibian. It lived in the Late Carboniferous and Early Permian Periods, mainly in central Europe. *Branchiosaurus* was similar in shape to the salamander of today, with the same sprawling limbs and a slim, tapering tail. There were no bones in its ankles and wrists. This led some experts to believe that *Branchiosaurus* was in fact a tadpole which belonged to one of the amphibians such as *Eryops*. The name *Branchiosaurus* means 'reptile with gills'.

BRONTOTHERIUM**30 MYA**

Brontotherium (bron-toh-thee-ree-um) was as long as a large car and about twice the height of an average 10-year-old child. The 'thunder beast' greatly resembled a giant rhinoceros of today, with thick legs, broad feet and hooved toes. It had a forked horn, which was shaped like a catapult, right at the end of its nose. *Brontotherium* was a herbivore that ate leaves and soft fruits and lived among the forests and woodlands of North America. Many were killed and buried by the ash from volcanic eruptions that occurred in the Rocky Mountains.

**C****CALYMENE****550 MYA**

Calymene (kal-i-mene) was a trilobite (three-lobed) which swam in the shallow seas during the Cambrian Period. Its body was divided into segments to which tiny limbs were attached. *Calymene* could crawl and swim, and when danger lurked it curled into a ball.

**CARCHARODON****30 MYA**

Carcharodon (kar-kar-oh-don), was an enormous shark with triangular teeth as long as your hand. It first appeared in the warm seas during late Tertiary times. Once thought to be as long as a whale, experts now think that *Carcharodon* was probably about the length of three cars. Its name means 'jagged tooth'.

CEPHALASPID**80 MYA**

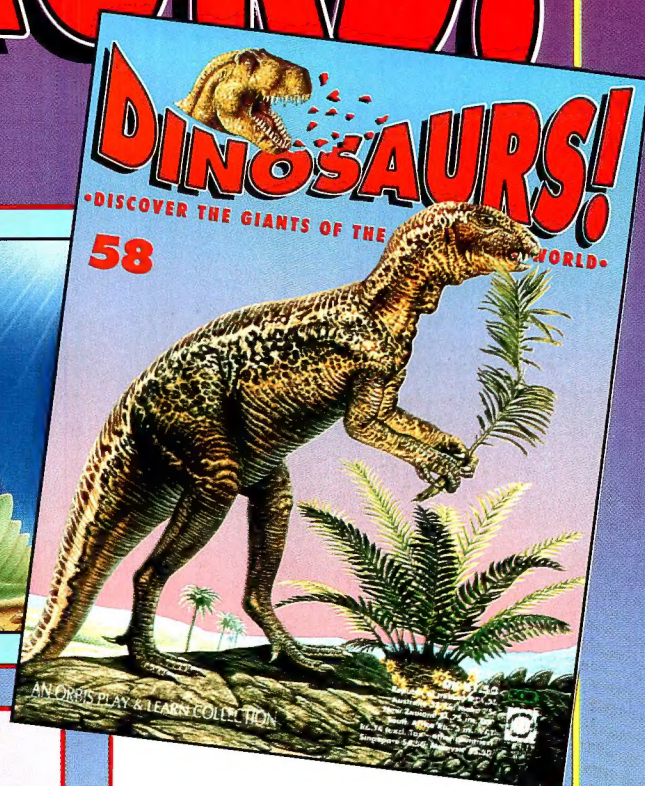
This family of fish, named after their distinctive 'head shield', includes *Hemicyclaspis* and *Cephalaspis*. These small fish lived near the bottom of freshwater lakes and rivers where they fed on food from the sea bed. Experts believe that *Cephalaspids* (kef-al-ass-pids) often swam a long way in search of food.

**MYA = MILLION YEARS AGO**

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Dr. David Norman of Cambridge
University answers your
dinosaur questions

ASK THE EXPERT



If dinosaurs had survived until today, would they look different from the ones of the Mesozoic?

If dinosaurs had survived until today they would be very different from the ones we know from the Mesozoic Era because they would have continued to evolve for a further 66 million years. Mammals, for

example, have evolved from small, almost mouse-sized creatures through a bewildering variety of types, from whales and bats to giant rhinoceroses and humans. So goodness knows what dinosaurs might look like if they were alive today. In fact,

maybe they are alive, but we do not recognise them because they are so different. Maybe we call them birds!



If Triceratops broke a horn, could it grow a new one?

If *Triceratops* broke its horn, it would not have regrown. The bony core of the horn would have snapped off and then healed over to form a stump, covered in thick, bony callus. The horny covering, however, would have still grown around the stump, to form a rather deformed horn. Probably not a pretty sight!



Did early birds of prey hunt small dinosaurs?

Almost certainly. Birds of prey, or raptors as they are called, are extremely aggressive and will attack almost anything that is small enough to be killed and eaten. So small or baby dinosaurs would have been constantly at the mercy of the flying raptors, especially during the Cretaceous Period when birds of prey flourished.

Why does *Tyrannosaurus rex* have two words in its name?

Carl Linnaeus, the Swedish philosopher, invented a system for naming all living organisms in the 18th century. Since then, people all over the world who study animals and plants have agreed to use his system. This involves the use of two names: the first or generic name (*Tyrannosaurus*) and the second or specific name (*rex*). The first name applies to a group of closely related animals such as the big cats. For instance, the generic name for the large cats is *Panthera* and the lion's full name is *Panthera leo* and the leopard's *Panthera pardus*. *T rex* is not a good example because there is only one *Tyrannosaurus* known at present.

